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E-Portfolios in the Interior Design Curriculum

A Review of the Literature and Development of an Implementation Plan to Enhance Practical Components of the Design Studio

This paper will review the academic literature to establish the rationale behind the integration of an ePortfolio into design studio projects, by looking at the challenges many design lecturers currently face with various practical teaching methods. This will lead to a discussion of how ePortfolios can be used to enhance and enrich these practical teaching methods, by using them to document the types of student learning and progression that takes place in the design studio class – which also mimic the design process followed in industry: Critique, Collaboration and Reflection. Based on the existing literature, this paper argues that these three key stages of interior design project work can be enhanced by the use of ePortfolios at each stage, and proposes an implementation plan that can be applied to achieve this. It is anticipated that this paper which examines the application of a pedagogical tool that has been applied to design studio education will be of interest to interior design educators, and encourage them to ask discerning questions regarding technology, and perhaps, embrace new ways of teaching and learning in the interior design studio. As well as challenging faculty in interior design programs, it also hopes to provide insight to employers who regularly seek out interior design graduates for sponsorship, placement or employment.

Introduction

The Design Studio Environment

Interior Design is a collaborative, problem-solving discipline, catering to the ergonomic needs that dictate how we live, work and play. Whether it is enhancing the way a space is used, or designing a piece of furniture based on the anthropometrics of the human form, interior design can creatively solve problems pertaining to the function and quality of our interior environments, and almost invariably, good design can enhance the quality of life and protect the health, safety, welfare and environment of the public (International Federation of Interior Architects & Designers, 2015). For the Dublin Institute of Technology's BA Interior Design, the studio class is where these types of problems are generally worked through and solved, with the support of lecturers and peers. The studio is also where major long-term design projects are designed, created, visualised, and critiqued. In addition to equipping students with the appropriate skills and ability to develop a creative approach to solving design problems, the DIT programme document stipulates that, upon completion, graduates will have a comprehensive understanding of the integration and evaluation of the work of other professionals in a design team (DIT BA Design Programme Document, 2010). Therefore, the open and engaging environment of the design studio and its dynamics between learners, becomes an integral place of collaborative learning for students while they work on their projects in an environment that is akin to the interior design industry.

It has been this author's goal to continually seek out new ways of engaging and assessing design students. After teaching interior design in both Ireland and Canada over the last five years, it has become evident that the integration of technology into the classroom is shifting the focus towards a more student-led approach to learning.

It is also been this author's experience that the majority of interior design students

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today are innately technology-led, and that this will only increase. Indeed, many design students are appearing to prefer to consume information as and when they want it - and in smaller, faster doses. Based on student feedback, the topic of technology in the classroom has been debated amongst many fellow faculty colleagues, whereby certain tools that promote both active and reflective learning seem to increasingly outshine the passive or surface approaches to learning, such as the formal lecture. In addition, there have been many instances where certain technological tools, such as social networking and design applications, have aided students in their communication of their ideas and progress, over more traditional practical methods of simply sharing their notebook work. Therefore, it is this author's opinion that this topical discussion amongst interior design educators suggests that the majority of design students may not fully understand or apply learning unless they are actively involved in it. It is this engaged critical model of teaching, where the lecturer facilitates the student to be constructors of their own knowledge, where the e-Portfolio holds potential to enhance some of the practical elements of the design studio class. By means of a literature review, this paper will establish the rationale behind the integration of an e-Portfolio into design studio projects, by looking at the challenges many design lecturers currently face with various practical teaching methods.

Challenges facing methods such as (i) the infamous *'crit'* or class critique, (ii) the discipline's well known collaborative aspects and (iii) the stages of reflection that are integral to a student's learning and progress, will be discussed. It will deliberate how e-Portfolios might be used to enhance these practical teaching methods, by documenting student learning and progression, encouraging peer collaboration and facilitating reflection – key stages of interior design project work, thereby allowing for the adoption of a key trend that is accelerating higher education technology today.

The research objective of this study is to facilitate the move towards a type of learning in the design studio that incorporates more student-led discussion, collaboration and critical analysis as sought by the DIT Program Document, but by leveraging the ever-increasing presence of technology in the classroom. It is important to note that the research is solely suggesting the use of e-Portfolios as an enhancement to current practical teaching methods in the studio, and not as a replacement mechanism. By having students stimulate the interest of their peers, the study also hopes to provide opportunities for students to learn in new nontraditional ways. It may also provide new opportunities in which to address certain issues, such as learning styles. Ultimately, the research hopes to build on the theory of constructivist teaching practices, and enable interior design educators to facilitate their students to take the lead on their own design processes, using e-Portfolios as an amenable means to do so.

The sections that follow establish the rationale for using e-Portfolios to enhance certain practical teaching methods in an interior design studio. They will include the theoretical framework and research methodology that was used to conduct the research, a detailed literature review on the value of the e-Portfolio in learning and assessment - as it pertains to this particular discipline - and conclude with a possible implementation plan for the e-Portfolio's integration into the interior design studio environment.

Rationale: Challenges Facing Current Practical Methodologies

The atmosphere of the design studio is similar to the 'Makerspaces' referred to in the Horizon report of 2014, where students learn and create together, integrating content and design-centered activities as part of their instruction. In this conducive environment, eLearning tools such as e-Portfolios and their applications can be experimented with and discussed with ease. In this regard, the design studio is an ideal space for students to experiment using a range of different learning tools and technologies. Currently, students in the studio work with a wide range of learning tools: 2D design notebooks and 3D visualisation, using both scale models and 3D modelling software. Design students are very well apt to technology, and often use multiple types of software simultaneously.

In regards to this particular area of design, the learning objectives are typically founded in a combination of theoretical, critical and practical teaching methodologies. To achieve these objectives, the majority

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of design projects areassessed by continuous assessment, with specific practical methodologies used in the studio. Some of the most common practical methods used, but not limited to, are:

1. The sharing, analysis and critiquing of work
2. Collaboration between peers, and
3. Reflection, occurring throughout each stage of a project.

Theoretical Framework and Research Methodology

In regards to integrating technology in an effective way, Rice et al. (2013) state that technology should be embedded within a learning theory to support the methodology, and that constructivist teaching methods focus on engaging the student in the learning process. A constructivist approach supports technological integration because teachers do not just dictate the information; they become advocates in the learning process, and this combined approach enables students to become more involved in learning activities: *"They [teachers] can create instruction that accommodates different learning levels and styles. They can broaden the range of detail and resources that are available to the learner. Technology becomes more than just another way to present information; it becomes the system in which information is presented."...* (Rice et al., 2013, p.11).

It is hoped that through this study, interior design educators will be able to recognise that e-Portfolios can allow them to design their instruction in a way that supports their theoretical approaches, and their students' learning styles, regardless of what they may be. Ultimately, by using a variation of engaging, interactive activities, and transforming the traditional lecture format, students will be able to take active roles in the educational process (Hsu et al, 2011). The use of technology to increase a student's attention is becoming much more prevalent, however, in order to ensure the technology tools are effectively used, it's imperative that they are implemented in conjunction with an appropriate teaching theory.

This study is an interpretative perspective of the literature on the use of e-Portfolios in higher education, as applied to a constructivist teaching and learning approach in an interior design studio environment. Studies which focus on the integration of the use of e-Portfolios in the classroom and also during student work placements were also reviewed, alongside the use of e-Portfolios to foster peer assessment, critical thinking and collaboration. The literature review also seeks to determine the value of the e-Portfolio within the context of an interior design curriculum, and induce the reader to theoretically apply this value to specific challenges facing current practical teaching methodologies, as described in the Rationale. The argument of the study is rooted in the theory of constructivist teaching practice, where students construct their own knowledge, scaffolded by tutors and learning from peers. The literature review as applied in this context then proceeds to inform the development of an implementation plan, to incorporate the use of e-Portfolios into an interior design studio class. This implementation plan is also informed by the author's own practice.

Literature Review

The Value of the e-Portfolio in Student Learning and Reflection

Beetham (2006) summarises the defining features of an e-Portfolio as a collection of digital resources or artefacts, comprising of:

- Evidence of an individual's progress and achievements, drawn from both formal and informal learning activities;
- Resources that are personally managed and owned by the learner, and
- Resources that are used for review, reflection, and personal development planning.

The basic concept of the non-digital portfolio, which is closely related to Beetham's defining characteristics, is nothing new in the design industry. Typically, artists and designers –both scholars and professionals alike- have always collected pieces of their best work to display to peers, future employers and clients. Within the visual arts, evaluation is primarily visual, with evidence of theoretical, practical and critical thinking having taken place during various creative and/or design stages. An e-Portfolio can be viewed as a direct digital evolution of this collecting of work.

Smith and Yates (2011) conclude that the e-Portfolio is ideally suited for developing creative abilities in students, with a particular value for student reflection. O'Keefe

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and Donnelly (2013) believe that the e-Portfolio is a *'space'* where:

- connections and participation between peers can be encouraged;
- reflection on learning can be represented through diverse forms of multimedia; - students can demonstrate their problem solving and evaluate their own learning, as they progress through the program.

The use of highly visual technologies such as graphics, sketching applications and videos that can be used in conjunction with e-Portfolios further enriches the learning process of new concepts, and often allows the learner to visualise concepts in a new way (Rice et al, 2013).

Variety and Types of e-Portfolios

In addition to what an e-portfolio might encompass, there are also an incredible number of types of e-Portfolios available, varying in scope, purpose and realisation. Hilzensaurer and Hornung-Prahauser consider there to be six different types of development, teaching, career, application, language and subject/course portfolios (Gooren-Sieber, 2014). Depending on the type or purpose of the e-Portfolio, Douglas Love et al. (2004), identifies five levels of growing, or maturing, at each stage of the learning process: 1) scrapbook, 2) curriculum vitae, 3) curriculum collaboration between student and faculty, 4) mentoring leading to mastery, and 5) authentic evidence for assessment and reporting. Love et al.'s e-Portfolio maturation levels could easily be applied to the re-designing of marking criteria of a design studio project that is based on continuous assessment. In order to introduce students to the use of an e-Portfolio for both learning and assessment, an implementation plan would be necessary to include these criteria. In addition, the plan would have to include a guideline of how some of the practical teaching methods that are currently being used in the studio might be enhanced, to support student learning, and facilitate with the continuous assessment format.

Achieving and Assessing Learning Objectives in the Design Studio

When asking, *'What is good learning?'* Klopfer et al. (2009) cite that many educators would give answers that revolve around:

- Students collaborating and discussing ideas, possible solutions;
- Project-based learning, designed around real world contexts;
- Connecting with other students around the world, on topics of study;
- Immersing students in a learning experience that allows them to grapple with a problem;
- Gaining higher-order thinking skills from pursuing the solution.

Kopfler et al. also point out that students indeed are already doing these things regularly outside of their classrooms. Every day, many students are spending countless hours immersed in popular technologies—such as Facebook or Myspace, World of Warcraft, or Sim City. Yet these genres of technologies—Social Networking, Digital Gaming, and Simulations—are engaging technologies that are providing them with the same opportunities as those listed above.

As introduced in the Rationale, there are three specific practical teaching methods which are used in the design studio to achieve learning objectives. These teaching methods are utilised at various key stages of an interior design project:

1. The sharing, analysis and critiquing of work
2. Collaboration between peers, and
3. Reflection, occurring throughout each stage of a project.

Challenge 1: Sharing and Critiquing of Work

A major component of the design process is the sharing and critiquing of student work. The current methods for sharing work in the design studio aim to enable students to articulate what they are learning amongst their peers, with the discussions facilitated by the lecturer. This involves a series of sharing sessions, or critiques, illustrating how each student is progressing through each stage of a project. Students present their work to the class, and the lecturer facilitates the discussion, providing constructive feedback and encouraging the class to contribute. One of the largest obstacles this method faces is the lack of motivation from the class to give quality, constructive feedback to their peers.

By using an e-Portfolio, students can upload particular milestones of their own learning, where they are struggling, or where they have made significant improvement in what they have done (Gower & MacLean, 2013). Students are able to document and share

their process of learning. At these various stages, the e-Portfolio can facilitate peer review and analysis of each other's virtual notebooks which can include reflections, technical drawings, photos etc., and offer their constructive feedback. By reviewing each other's work in this way, the e-Portfolio allows students to develop reflective and critical thinking skills, evaluating and providing thoughtful responses, encouraging and supporting the work of their peers (Stevenson, 2006). Students can also provide their feedback in an anonymous or less public fashion, thereby allowing shy students or English learners who may be hesitant to participate in class, but might feel more comfortable contributing to the critique in a computer mediated-discussion, the opportunity to contribute their views, all the while monitored by the instructor (Stevenson, 2006).

Challenge 2: Encouraging Collaboration

At the recent Interior Design Educators Council 2015 Annual Conference, Furlong & Gentry (2015) stipulated that the interior design discipline is becoming much more collaborative, faster paced, more diverse, and less clearly defined. Collaboration in the design studio takes place in a neutral, yet boisterous environment, where students are free to move about and discuss their work with both the instructor and their peers. This type of collaborative learning is essential for students to experience, as it mimics the collaboration that happens between designers and clients in the industry. A collaborative process is crucial in solving important design problems.

However, design educator McCoy (2014) believes that collaboration between designers, while it is essential and important, is not enough for managing today's complex, global society; It is vital to the industry that designers learn to reach across disciplinary boundaries to experts who provide crucial information, insight, and perspective relevant to the project at hand (McCoy, 2014). McCoy further reiterates the familiar challenge many design faculties face: student discontent with assignments requiring team collaboration. McCoy references the design student research study by Amanda J. Gale et al., The Burnout Phenomenon (2014), where they found that although student appreciation for developing strong collaborative skills increased with each succeeding year in the design program, students' taste for collaboration steeply declined over time. Gale et al. concluded that this will be detrimental for entry-level designers who almost immediately will be expected by employers to contribute to collaborative assignments, typical of the industry - the fact is, strong design is rarely conceived and executed by one person alone (McCoy, 2014). In addition to the client, a design team often requires in-depth communication between multiple designers and other disciplines, all monitored by office management and staff who must also work closely with the installation team, and so on. Introducing and monitoring successful collaborative processes in the design studio is integral to showing design students the value of interdisciplinary teamwork in the workplace, which will eventually provide easier entry and quicker assimilation of young designers into the profession (McCoy, 2014).

The collaborative use of e-portfolios would enable design students to both create and problem-solve the various stages of their design work with their peers. e-Portfolios can also be used in conjunction with collaborating software applications, where real-time collaboration features are built into the application. These allow multiple users to log into the same system, synchronously or asynchronously, to jointly work on a design project, while discussing through chat or instant messaging (Stevenson, 2006). At the early concept stage of a design project, students are brainstorming, researching and sketching, and synchronous feedback exchange is far superior to asynchronous modes of concept-mapping (Stevenson, 2006). There are copious mind mapping tools and graphic design applications that will allow students to create mood boards, sketch ideas and share them instantly using a variety of devices. A good example of real-time collaborative work that could be included in e-Portfolios is the role-playing software being used at Ryerson University, called Lake Devo. Lake Devo would allow interior design students to explore the interdisciplinary dimensions of a typical interior design project. The resulting Lake Devo film that is created can be uploaded into their e-Portfolios for sharing, critique and

reflection. In addition, whether the e-Portfolio is being used for an independent project or a group one, peers could be encouraged to contribute feedback to each other, based on role-playing criteria, with extra marks offered to those who provided valuable feedback. Feedback would be assessed on various criteria, and its quality, quantity and richness. Peers would also have the option to build on the prior constructive feedback given by the instructor in class, and if permitted, by allowing friends and family to comment on their group collaborations. Furthermore, collaboration could happen both virtually and in the classroom, with students working in pairs, small groups and/or independently, with updates added daily/weekly to e-Portfolios to track the group's progress. Rudestam and Schoenholtz-Read (2010) argue that e-Portfolios can be effectively used for group work, that there is no impediment technically to a group e-Portfolio, and that there is a convergence among many types of social networking that can be utilised within a group e-Portfolio.

Furthermore, the model of design studio collaboration via the e-Portfolio has the added possibility of being broadened virtually, as a new area of increased focus in design studio projects: real-life design projects. Wang, Vaux and Xu (2014) look at collaborative student–community interactions to examine how both student and community benefit from the collaborative design process. Wang et al. (2014) point out that students are stimulated and encouraged with real-world projects, and communities can have real –and free- access to creative problem solving, specific to their unique community needs; this differs from traditional design studio approaches, where projects are often based on fictional problems, or altered realworld situations. In this way, students are experiencing the real-world dynamics of the team collaboration that takes place whilst working on a real-life project.

Challenge 3: Facilitating Reflection

A recent challenge that has developed with design students is the inclusion of enormous amounts of content, thanks to the convenience and vast resource of the internet. Students are retrieving information during their research stages, yet not always reflecting or fully understanding why they have included it. Often, unless an instructor questions their research or inspiration content, a student may never reflect on why it had inspired them in the first place. Likewise, students rarely critically reflect on their own progression, unless they have been critiqued, or had something specific pointed out to them. MIT Media Lab academic Michelle Hlubinka states: *"When designing things, we too often stop after the first two steps of the design process: coming up with ideas ("imagine") and making them come to life ("realize"). These two steps alone seem like such an accomplishment, who could ask for more? But without critiquing and reflecting on the things we've created, we miss out on many important opportunities to improve our creations, learn new things, and share our ideas with others."*

The e-Portfolio is a collection of digital artefacts that have been gathered during each step of a student's learning, and can include reflections on learning processes and experiences. Students can also reflect on comments from instructors, peers and mentors, on what they have submitted (Lorenzo & Ittleson, 2005). Reflections also enable students to demonstrate competencies, uploading evidence and reflections which can contribute to assessment. Smith & Yates (2011) highlight that by having students reflect on their own learning experiences, they are forming an integral part of the e-Portfolio assessment strategy, and dedicated time for reflection is critical to allow the students space and time, to appreciate their personal development during each stage of learning.

Unfortunately, students do not always come to class with the ability to reflect, or they are unable to be aware of their own reflections whilst working on a project; e-Portfolios are useful in prompting students with guided reflection reminders, that can occur at the beginning, middle, and end of the semester (www.cte.cornell.edu).

In addition to being useful for prompting reflection at key stages, the e-Portfolio can also serve as a place to capture learning that happens in a variety of contexts, and making sense of that learning requires focused reflection on those experiences (Light et al, 2012). Furthermore, with technological advances, students can document

their reflections by not only text, but also video blogs, audio recordings, and other media (Light et al, 2012).

Additional Benefits

In her forword of the Handbook of Research on e-Portfolios, Barker (2006) summarises 18 reasons why the e-Portfolio represents the single greatest innovation in the use of learning technologies. In relation to overcoming the challenges discussed in this paper, and enhancing the practical dimensions of the design studio, a selection has been adapted from Barker's list and applied to the context of this paper (Figure 1):
Using new technology like the e-Portfolio can also aid in assessment, allowing us to see the process in which students are developing their work: recording their work in progress, who is doing it, and distinguishing one student's work from another. In the 2013 video by PiTeach, E-Assessment: Where Next, a team of academics studying the benefits of using e-Portfolios as a form of assessment were able to divide up each element of the e-portfolio and assign it a series of marks (http://pitvpk.com/iptv/index.php/video/11851/e-assessment-where-next/#, 2013).

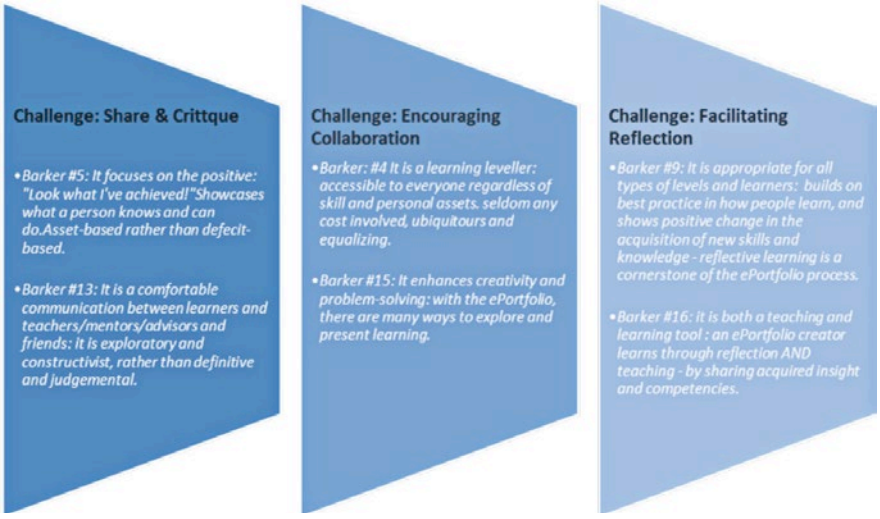


Fig. 1 Adapted by the author from the Handbook of Research on EPortfolios, Foreword by Dr. Kathryn Chang barker, President, FuturEd Consulting Education Futurists, Inc., Canada (2006).

This would be a reliable approach to marking a student's progressive design work, complementing the curriculum format of continuous assessment. Having the work digitally and simultaneously available visually, the team was able to create a very robust hierarchy, and the work ordered itself accordingly. An instructor can see which student had travelled on the longer learning journey, and demonstrated more skill. From this, the instructor can then implement the normal awarding process, in accordance with the project marking criteria. Selected principles from the 2014 Horizon Report's Creative Classrooms Concept also reiterate how using an e-Portfolio to overcome the challenges discussed here may not only help to achieve learning objectives, but may also compliment the continuous assessment format generally used in design studio classes. Figure 2 illustrates the 'Creative Classrooms Concept', demonstrating how the successful use of e-Portfolios could attain many of these practices, with a particular focus on the following:

Assessment: 4 (the use of online applications for meaningful activities) Learning: 8, 9, 11, 12, 13 (Research, design creation, learning at their own pace and sharing portfolios with peers) Teaching: 15, 16 (Addressing the individual strengths and learning styles in the class) Organisation: 20 (Monitoring the quality and richness of the work that is being explored, created and shared) Connectedness: 24, 25, 26 (Connecting students with peers, mentors, teachers and community; current design events and exhibitions, networks and industry and having them include their connections/links) (see fig 2).

The Development of an Implementation Plan for e-Portfolios to Enhance the Practical Component of the Design Studio Class

The Centre for Teaching Excellence at Cornell University summarises several issues an instructor should consider before integrating e-Portfolios (http://www.cte.cornell.edu/teaching-ideas/teaching-with-technology/e-Portfolios.html#how, 2014):

1. Have a clear learning purpose for using an e-Portfolio and share this with students.
2. Develop e-Portfolio learning activities to use throughout the semester.
3. Develop clear rubrics and marking criteria, or set of guidelines, which will be largely influenced by the learning purpose of the e-Portfolio. Assessment of feedback between peers should be included in the project brief's marking criteria.

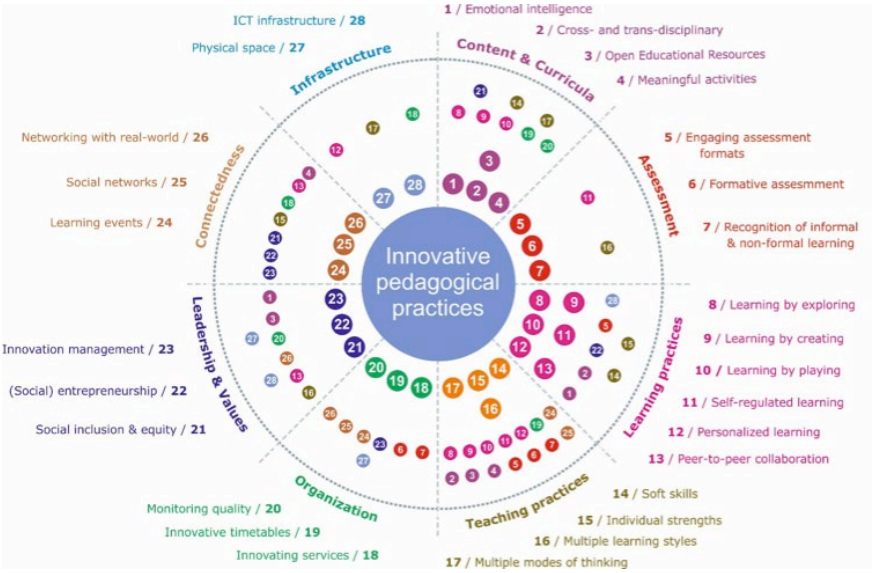


Fig.2 Creative Classrooms concept, The Horizon Report 2014

Feedback that is constructive only, should be assessed by criteria such as quality of writing, quality of the feedback, and if it offers new guidance to the learner – for example, directing their peer to look at reliable, and relevant sources of information directly related to their work.

4. Develop a strategy for assessing plagiarism. If the assessment criteria includes more than just the end product – such as the continuous assessment format used in the design disciplines – where research notes, feedback, and sketches etc. are marked, it is more difficult for students to simply plagiarise. In regards to the visual nature of the subject, Google Image Search has added the option to restrict the results to images that are licensed using Creative Commons, in addition to other public domain image sources.

Before implementing e-Portfolios, a detailed set of guidelines pertaining to issues such as peer collaboration, organisation and layout, content suitability, privacy settings and ownership must first be established. Butler (2006) suggests some questions to assist teachers in preparing such guidelines and anticipating student queries (Fig.3).

Fig.4, also adapted from Butler (2006), demonstrates a possible sequence an instructor might use when introducing students to e-Portfolios for the first time:

Fig.4, Adapted from Butler, 2006. In addition to Butler's guidelines, an e-Portfolio implementation study ran from 2010–2011, led by Gordon Joyes at the University of Nottingham. The output from this JISC-funded project was an open resource e-Portfolio implementation toolkit.

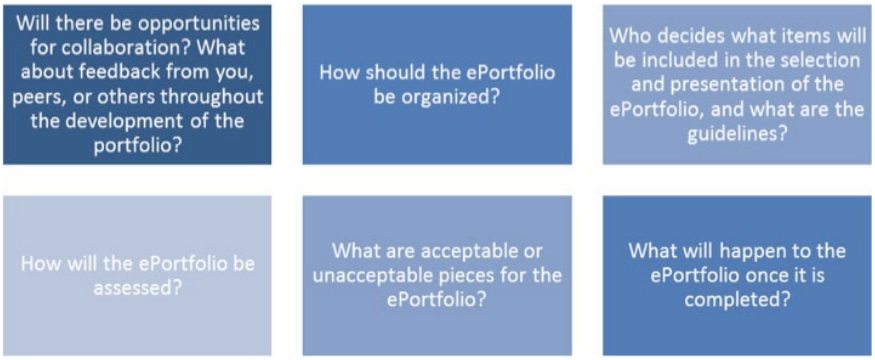
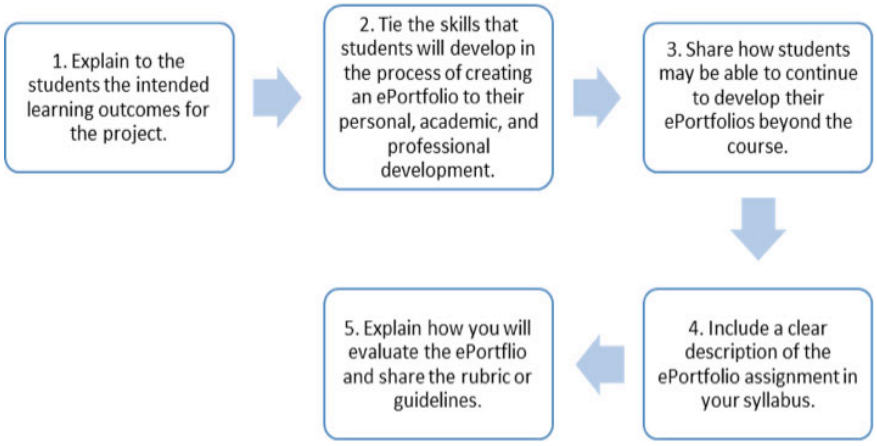


Fig.3 Adapted from Butler, 2006.

Fig.4, Adapted from Butler, 2006.



The study aimed to:

- Identify salient messages from examples of large-scale e-Portfolio implementations to help inform future practice and strategy;
- Articulate models of implementation;
- Support a range of users in identifying and addressing issues relevant to their context.

The toolkit was designed to support those involved in the implementation of e-Portfolios in higher (HE) and further education (FE) and work-based learning. It provides a highly useful and easy to understand implementation model and various forms of guidance (https://epip.pbworks.com). According to the study, five key principles need to be considered for successful implementation by practitioners.

These are:

1. Purpose needs to be aligned to context to maximise benefits: Some contexts suit some purposes more than others and this needs to be determined by an analysis of the benefits (and costs) of the purpose in that particular context.
2. Learning activity/ies need to be designed to suit the purpose: There must be a conscious design and support of a learning activity/activities suited to the purpose and the context.
3. Processes need to be supported technologically and pedagogically: The processes involved in the creation of an e-Portfolio in the particular context must be understood by both learners and practitioners, and both technical and pedagogic support needs to be provided.
4. Ownership needs to be student centered: The e-Portfolio processes and outcomes need to be owned by the learner.
5. Transformation (disruption) needs to be planned for: e-Portfolios are potentially transformative and as a result can be disruptive from a pedagogic, technological and an institutional perspective because they tend not to fit exactly within existing systems.

Table 2: five key principles need to be considered for successful implementation by practitioners. https://epip.pbworks.com/w/page/28670505/The%20e-portfolio%20implementation%20toolkit

Unlike Butler, the JISC e-Portfolio implementation toolkit also emphasises that a preliminary experiential implementation journey is a necessary prerequisite for developing a contextualised understanding and achieving successful e-Portfolio adoption.

Design thinking is a problem-solving process of discovery, idea creation, and experimentation that employs various design-based techniques to gain insight and yield innovative solutions (www.wagner.nyu.edu). Moving forward, it will be crucial to identify the best practices for e-Portfolio integration further into a design program.

Fundamentally, organising the structure and requirements of the e-Portfolio will be imperative, and keeping students informed constantly. There is much opportunity to integrate the power of the Web into e-Portfolios, and extend course materials beyond standard texts and learning methods. It is hoped that

with their use, e-Portfolios will enable more learner-centered experiences into the design studio and its creations.

Conclusion

Involving or actively engaging learners was viewed by Confucius as the most effective method for learners to retain information (Hsu et al, 2011). This involvement Confucius dictates is the same cry our 21st century students are expressing in their desire to be involved and engaged in their learning process. Prensky (2001) refers to today's tech-savvy group of students as 'Digital Natives', and Oblinger & Oblinger (2005) call them the 'Net Generation'. Regardless of the term, the majority of these individuals were born into a world of technology, where they are tech-obsessed and spending the majority of their days staring at computer monitors and tapping on Smartphone screens (Hsu et al, 2011). Not only do today's students own many technological gadgets, but they also report relying on them for academic purposes (Hsu et al. 2011). Interestingly, Hsu et al. also refer to the fact that, although students are tech-savvy, they are far less enthusiastic about their professors *'use of technology to advance their educational experience'*; overall, students say their instructors use of presentation devices (i.e. PowerPoint) do not inspire participation or interactivity. Hsu et al. are directly relating back to the traditional classroom environment where lectures do not always ignite interaction between the instructor and his/her students, even though technology may be present.

As described in this study, the e-Portfolio has many beneficial attributes in regards to teaching and reflection, with a particular benefit to a selection of design studio teaching methodologies. From the literature review, it is clear that e-Portfolios are also adaptable to any discipline that might make use of portfolios to represent and document student work (computer science, engineering etc.). It is hoped, with careful considerations for the implementation steps illustrated above, that the interior design studio class will benefit from the use of the e-Portfolio and its rich set of tools and practices, to support the practical dimensions of such a programme.

> "Creative Classrooms Concept also reiterate how using an e-Portfolio to overcome the challenges discussed here may not only help to achieve learning objectives, but may also compliment the continuous assessment"

A follow up to this research is also currently being prepared by this author, in regards to the specific benefits the e-Portfolio may have as a support structure within a work placement component of a design degree at the Dublin Institute of Technology in Ireland. The findings hone in on the students' sharing of their e-Portfolios as extremely beneficial to their learning, lending the e-Portfolio to be evolving into a new support structure in itself for the student work placement.

One recent significant change in higher education, the Open University, was set up by the British Government to create distance learning opportunities available to all.

It was a novel concept at the time, and one that is now being adopted in many parts of the world. On the increased presence of technology in the higher education classroom, Martin Bean, OU's vice chancellor explains: *"Students now view technology, fast access and real time interaction as being an absolute necessity in their life. Higher education has to step up and embrace the technology of the day, not just the web, but new tablet and mobile devices, that are proliferating the world, and directly link them into our learning environments, so that they can get as much out of a tablet or device for education that they can for entertainment, if not more: to use it as a higher education learning device. However, the personal side, the personal interaction with students is where the real magic happens. What's interesting though, is that the web is moving from being contentcentric to more people-centric; people are engaging with each other and interacting in new ways.....this versus the conventional classroom? It all comes down to the quality of the teaching that is being given"* - Global Business with Peter Day: Class Struggle, 20:32, 22/01/12, BBC World Service.

Bean's views echo the need for educators to be responsive to students 'modern day needs. With incredible advances in technology and shifts in cultural, social, political, and economic conditions, today's interior designer requires a far more integrated and diversified knowledge than ever before (Furlong and Gentry, 2015). Likewise, today's digital learner is accustomed to a fast-paced world of electronics, and the interior design studio must keep the tempo to engage and inspire the 'Net Generation': *"Students are no longer content with sitting back and being spectators of the event, fans of the show. They yearn to be part of the performance, in on the action."* - Hsu et al, 2011, p.2.

In closing, the implications this research has for interior design education is twofold:

- Recognition: of the correct use of technology and its implementation within the curriculum and,
- Acknowledgement: of the imminent presence of technology within our design studios, and how this can be leveraged to achieve the desired learning outcomes of a program, project or field work placement

In addition, new and innovative approaches to enabling collaboration and critique between students on a global level could easily be supported through a student's e-Portfolio. One such collaborative technology is Durham College of Ontario's Global Classroom. Linking classrooms across continents, the global classroom enables students to participate in virtual classrooms, enabling them to learn from, and share with, students and experts from around the world in real-time, an opportunity that most would never have, if not for the global class. Facilitated by instructors with a common learning outcome alongside a key expert from the field, this type of live collaboration has the potential to equip interior design students with a global perspective on a specific design concept topic that numerous interior design curriculums internationally may be addressing. The quality of peer feedback would have the valuable added dimension of international insight. Increasingly, 'Global Citizenship' is a term being included in the list of skills, knowledge, and attitudes that university graduates should possess, regardless of their disciplinary studies (Schweisfurth, 2014).

Therefore, new methods of collaboration, critique and inquiry such as the Global Classroom concept appear to echo the potential to expand students' inclusive understanding of the IFI's message cited at the beginning of this paper of 'Design for All', wherein good design can enhance the quality of life and protect the health,

safety, welfare and environment of the public. It is within this international realm where ethical imperatives may be further embedded in students' design thinking. By incorporating new technologies such as this, the e-Portfolio has the ability to become more than just a simple collection of artefacts or digital record of a student's progress and achievements: it has the ability to encapsulate the collaboration and problem-solving skills of a global design community – a global collaborative design studio.

With Smart Homes, intelligent Building Management Systems and 3D Printing, social media and mobile app computing will become standard tools of the trade for designers. They will be designing interactive spaces using touch screens that will connect internal and external networks, and can be used as digital imagery displays when they are otherwise not in use. More of the products they design and specify will incorporate smart technologies, all linked to a single controlling device, such as a smartphone or tablet (Henry, 2011). It is hoped that this research will act as an insight to interior design educators to move design studio practice forward - but by allowing the students to construct their own futures.